

Group A: PROJECT MANAGEMENT

A.1 Title and Approval Sheet

Quality Assurance Project Plan

Temperature Reduction and Erosion Reduction in Lower Cow Creek

Submitted by:

New Mexico Environment Department
Surface Water Quality Bureau

APPROVAL SIGNATURES

_____ John Moeny Project Officer, SWQB	_____ Date
_____ Miguel Montoya Quality Assurance Officer, SWQB	_____ Date
_____ Abraham Franklin Program Manager, SWQB	_____ Date
_____ Kyla Chandler State & Tribal Grant Project Officer, Water Division, EPA Region 6	_____ Date
_____ Nelly Smith Chief, State and Tribal Programs Section, Water Division, EPA Region 6	_____ Date

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ACRONYMS

DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
NMED	New Mexico Environment Department
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedures
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
UPWA	Upper Pecos Watershed Association
WQPD	Water Quality Protection Division

A.3 Distribution List

Project Officer will ensure that copies of this approved QAPP and any subsequent revisions are distributed to the project personnel listed in Table 1. All members of the distribution list will review the QAPP and sign the Acknowledgment Statement prior to initiating any work for this project and return to Project Officer.

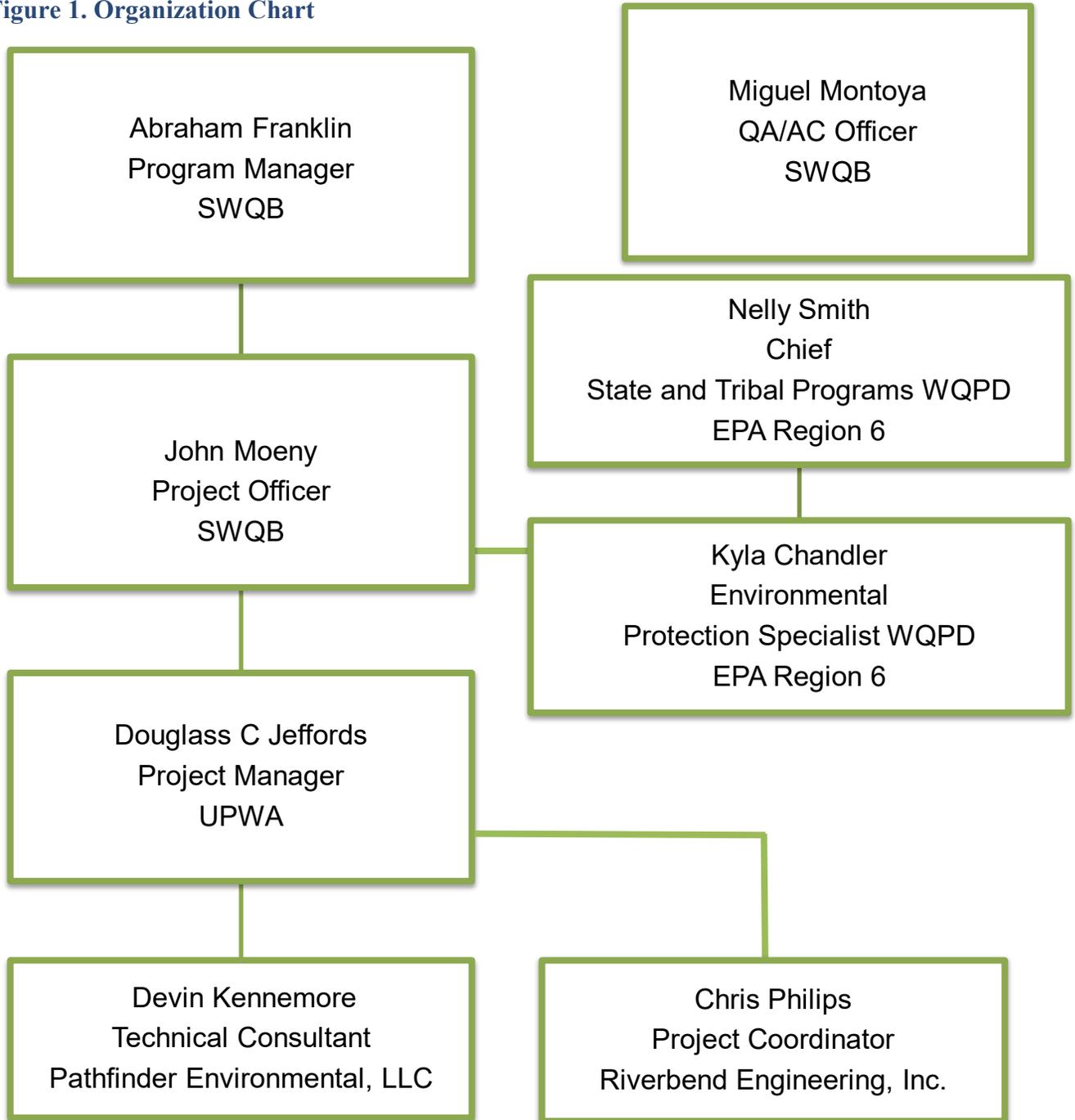
Table 1. Distribution List, Project Roles, and Responsibilities

Name	Organization	Title/Role	Responsibility	Contact Information
Abraham Franklin	SWQB	Program Manager	Reviewing and approving QAPP, managing project personnel and resources	(505) 946-5952 Abraham.franklin@state.nm.us
Miguel Montoya	SWQB	QA Officer	Reviewing and approving QAPP	(505) 819-9882 Miguel.Montoya@state.nm.us
John Moeny	SWQB	Project Officer	Preparing and revising QAPP, distribution of QAPP, project reporting, coordinating with contractors, oversight of data collection, and EPA reporting	(505) 819-9868 John.Moeny@state.nm.us
Douglass C. Jeffords	UPWA	Project Manager	Project oversight, data management, and submittal of quarterly reports	(505) 699-1235 dcjeffords@aol.com
Devin Kennemore	Pathfinder Environmental, LLC	Technical Consultant	Field monitoring, data collection, record keeping, and submitting reports	(505) 699-5175 devin@pathfinderenvironmental.com
Chris Philips	Riverbend Engineering, Inc.	Project Coordinator	Project design and implementation, construction oversight	(505) 469-2600 cphilips@frontier.net
Kyla Chandler	EPA	Environmental Protection Specialist WQPD, Region 6	Reviewing and approving QAPP	(214) 665-2166 chandler.kyla@epa.gov
Nelly Smith	EPA	Chief, State and Tribal Programs Section WQPD, Region 6	Reviewing and approving QAPP	(214) 665-7109 smith.nelly@epa.gov

A.4 Project Organization

The SWQB Quality Management Plan (NMED/SWQB 2009) documents the independence of the Quality Assurance Officer (QAO) from this project. The QAO is responsible for maintaining the official approved QAPP. Figure 1 presents the organizational structure for the Lower Cow Creek Project.

Figure 1. Organization Chart



A.5 Problem Definition/Background

The purpose of this Quality Assurance Project Plan (QAPP) is to define the methodology for monitoring the effectiveness of the Stream Temperature (temperature) Reduction and Erosion Reduction in Lower Cow Creek Project. This QAPP refers to the project as the “Lower Cow Creek Project.” The Lower Cow Creek Project is being managed by the Upper Pecos Watershed Association (UPWA).

EPA funding under Section 319 of the Clean Water Act provides resources to implement activities described in the document: *Workplan, Nonpoint Source Program Effectiveness Assessment, 2008-2011*. The workplan states, “This (effectiveness monitoring) project will develop and implement a statewide program to assess the effectiveness of 319 watershed projects on water quality.” Task 5 of the workplan, titled *Environmental Baseline Data Collection and Post-Implementation Monitoring*, states that the project will conduct pre-construction baseline data collection and post-construction monitoring.

This QAPP is a companion document to the SWQB QAPP (*Surface Water Quality Bureau Quality Assurance Project Plan for Water Quality Management Programs*, NMED/SWQB 2016a or most current version). The SWQB SOP (*Standard Operating Procedures for Data Collection*, NMED/SWQB 2016b) is incorporated in the SWQB QAPP by reference. All of the policies and procedures specified in the SWQB QAPP will be followed for the Lower Cow Creek Project, unless otherwise specified.

When changes affect the scope, implementation, or assessment of the outcome, this QAPP will be revised to keep project information current. The Project Officer, with the assistance of the QA Officer, will determine the effects of any changes to the scope, implementation, or assessment of the outcome on the technical and quality objectives of the project. This Project Plan will be reviewed annually by the Project Officer to determine the need for revision.

Objective

The objectives of the environmental monitoring component of the Lower Cow Creek Project are to assess the baseline water temperature condition of Lower Cow Creek and to identify the temperature reduction in the Lower Cow Creek Watershed (USGS HUC 130600010104), where the restoration project will be implemented. The secondary objective of the monitoring is the assessment of canopy cover (shade) improvements over the creek as a result of implementation of the Cow Creek Project (see Appendix for approved scope of work from Response to Proposal).

Background

The New Mexico 2014-2016 Clean Water Act Section §303(d)/§305(b) Integrated Report, Appendix B recognizes three stream segments in the Upper Pecos watershed as being impaired for temperature (Table 2) with the probable sources of impairment including:

highway/road/bridge runoff (non-construction related), loss of riparian habitat, rangeland grazing, stream bank modifications/destabilization, and watershed runoff following forest fire. The temperature listings for the following segments were first reported in the 1998-2000 §303(d)/§305(b) Integrated Report.

Table 2. Temperature impaired stream segments in the Upper Pecos watershed

Impaired stream segments	Cause for impairment
Cow Creek (Bull Creek to headwaters) 22.3 miles length	Temperature
Cow Creek (Pecos River to Bull Creek) 15.6 miles length	Temperature
Pecos River (Cañon de Manzanita to Alamitos Canyon) 5.7 miles length	Temperature

The overarching goal of this project is to produce measurable reductions in water temperature at the lower end of an approximately 0.75-mile-long segment of Cow Creek (Pecos River to Bull Creek, AU NM-2214.A_090) and contribute to the temperature load reduction goals for the upper Pecos watershed outlined in the 2005 Pecos Headwaters TMDL (Table 3) (NMED/SWQB 2005).

Table 3. Needed temperature reductions and increases as calculated from the 2005 Pecos Headwaters TMDL

Stream reach	Temperature reduction	Shade increase	Load reduction (j/m ² /s)
Cow Creek (Bull Cr. to headwaters)	2.5 degrees C.	25%	17.61
Cow Creek (Pecos River to Bull Cr.)	0.9 degrees C.	8%	48.71
Pecos River (Alamitos Cr. to Cañon de Manzanita)	5.8 degrees C.	38%	100.84

For the Cow Creek (Pecos River to Bull Creek) Assessment Unit, the water quality standard for temperature is achieved when the percent total shade is increased to 61 percent, although the actual Load Allocation (LA) (which includes a margin of safety) of 73.0 j/m²/s is achieved when shade is further increased to 65 percent.

Thus, the goal for this project is to increase canopy cover along a 0.62-mile long segment of Cow Creek (Pecos River to Bull Creek) by 8 percent and to produce an estimated reduction in temperature of 0.07 °C by 2020. This stated goal might not be achieved until the planted vegetation along the reach matures and develops a full canopy; however (all other factors being held constant), UPWA anticipates some measurable progress will be made by 2020 that

demonstrates a trend towards achievement of the temperature reduction goal. If the referenced temperature modeling is correct, the anticipated increases in shade will certainly achieve the stated goal in water temperature reductions over a longer time frame of 10 to 15 years.

A.6 Project/Task Description

Description

The Lower Cow Creek Project will monitor temperature and riparian stream percent shade condition. Acquisition of temperature and shade conditions will occur before implementation of restoration activities to establish pre-treatment (baseline) conditions. Post-construction monitoring of temperature and percent shade conditions will occur to determine temperature load reductions and shade increases achieved by the project. These activities will occur independently from restoration activities.

The study design consists of temperature monitoring stations upstream and downstream of the restoration project to determine reductions in temperature after project implementation. Canopy cover monitoring will occur at restoration project sites. Exact locations will be determined in the field by the Technical Consultant, Devin Kennemore, with the assistance of the Project Coordinator, Chris Philips based on professional judgement within area identified in Figure 3

Schedule

Baseline data collection was collected during the summer of 2017 under the supervision of NMED SWQB staff and the NMED SWQB QAPP. Additional baseline temperature and canopy cover monitoring is planned for the summer of 2018. Temperature data loggers will be deployed in May and will record data during the warm season, from June 1 through September 30, to capture daily maximum temperatures, and then retrieved in October. Percent shade on the creek will be once in Spring 2018 (see Table 4).

Table 4. Project Implementation Schedule (Assumes pre-contractual voluntary baseline monitoring in 2017 under NMED SWQB QAPP and start date of September 1, 2017)

Task/Responsible Party	Approximate Start Date	Approximate Completion Date
1. Project Management/UPWA	September 29, 2017	December 31, 2021
2. Project Administration and Reporting/UPWA	September 29, 2017	December 31, 2021
3. CWA Compliance/Riverbend Engineering	July 15, 2018	September 15, 2018
4. Development of Temperature Reduction and Erosion Reduction in Lower Cow Creek QAPP/Pathfinder Environmental	January 3, 2018	April 30, 2018

Task/Responsible Party	Approximate Start Date	Approximate Completion Date
5. Environmental Baseline Data Collection and Post-Implementation Monitoring/Pathfinder Environmental	May 15, 2017	October 15, 2021
6. Biological and Archaeological Surveys and Reporting/Pathfinder Environmental	April 2, 2018	June 30, 2018
7. Design, Management, and Construction Management/Riverbend Engineering	April 20, 2018	December 15, 2018
8. Provide and Install Plants/Riverbend Engineering	October 1, 2018	December 15, 2018
9. Seed and Mulch in Restoration Areas/Riverbend Engineering	October 1, 2018	December 15, 2018
10. Installation of Woody Debris Structures, Boulders, and Crossvanes/Riverbend Engineering	October 1 1, 2018	December 15, 2018
11. Landowner workshops/Pathfinder Environmental	March 1, 2018	September 1, 2019

Project Area

The project area is located entirely on private land along a 0.75-mile segment of the Cow Creek Assessment Unit (Pecos River to Bull Creek, NM-2214.A_090), upstream of North San Ysidro, NM, within the 12-digit Hydrologic Unit Code (HUC) number 130600010104 (Figure 2). This priority reach is near the lower end of approximately 15.57 impaired stream miles in total (2016-2018 Clean Water Act Section §303(d)/§305(b) Integrated Report). This Assessment Unit encompasses 22,253 acres in total. The project area consists of approximately 0.75 mile of Cow Creek and approximately 9 acres of land area, assuming a 100-foot corridor width where the project will be implemented (Figure 3).

From a qualitative standpoint, this reach is in “good” to “fair” condition in most locations. Entrenchment to bedrock is common throughout the project area. Riverbank erosion is scattered and unevenly distributed, with most occurring in the lower half of the project area. Shade over the stream is good in most places, although frequently threatened by erosion and absent in areas with the highest degrees of erosion. Heavy grazing and agricultural practices continue to plague this reach of the creek. Local landowners have taken significant measures to protect the stream bank in a number of locations, but these “fixes” have subsequently led to unanticipated consequences downstream.

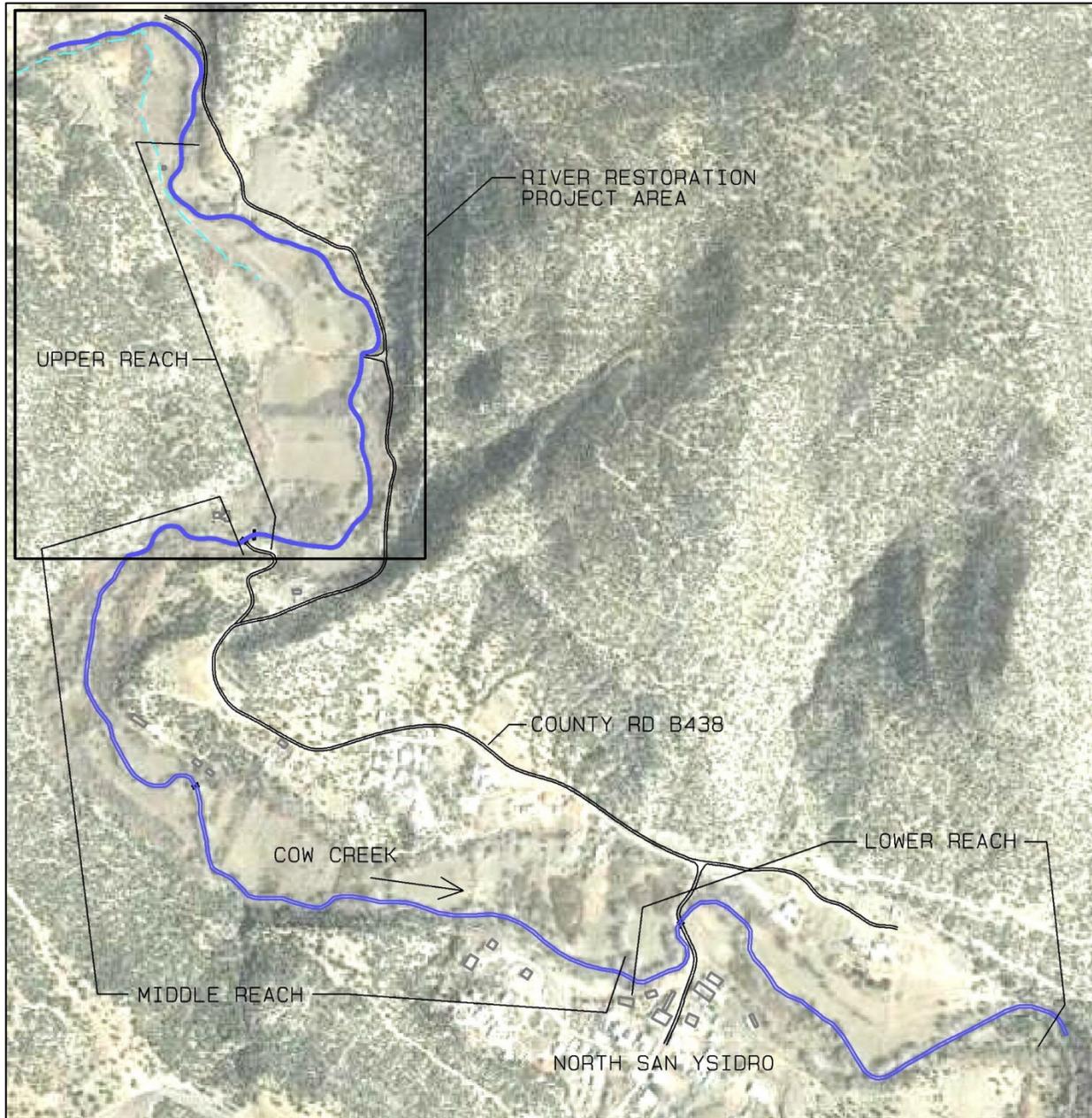


Figure 2. Lower Cow Creek Project Area

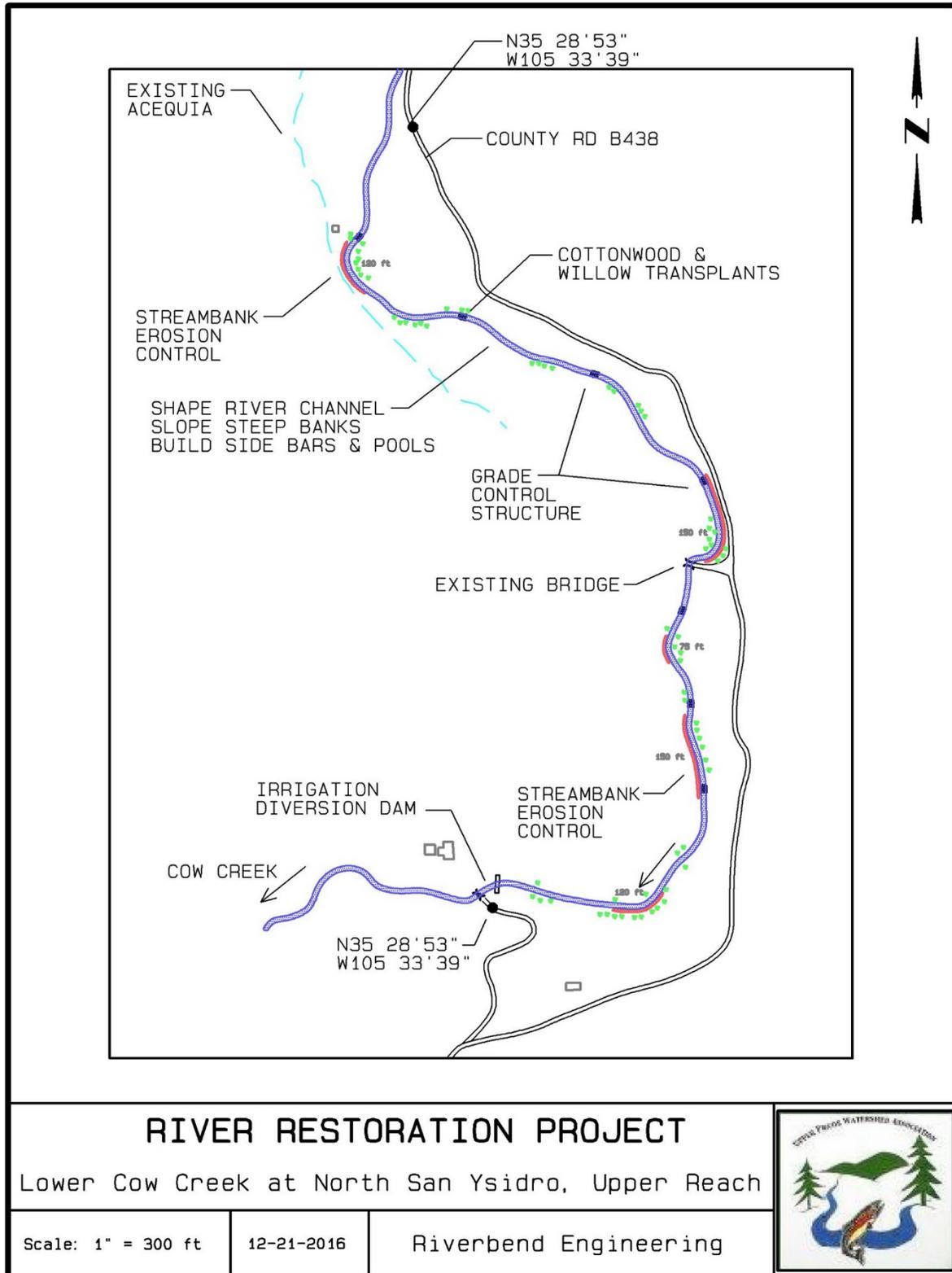


Figure 3. Schematic of proposed restoration areas in the lower Cow Creek project area (Riverbend Engineering, LLC). Green dots = revegetation; Red lines = in-stream restoration

Location Selection Criteria

The Contractor's rationale for selecting this project was based on three considerations: First, our goal is to implement and complete an on-the-ground project that achieves some measure of water-temperature load reduction in the Cow Creek Assessment Unit as described in Chapter 5 – Management Measures, Restoration Techniques (pages 52-54) of the Upper Pecos WBP. The second consideration is to implement a project that will improve riparian habitat in the near-term (within the 4-year project life) and to use the project to showcase and promote the use of similar restoration techniques to landowners along the Pecos River and Cow Creek in future public outreach and education work. Third, the Cow Creek project area is a prime example of an area where the benefits of the proposed restoration would serve as a demonstration and model for other landowners upstream and downstream within the Assessment Unit. The benefits of reducing erosion along this reach using the techniques described in the Upper Pecos WBP and employed by this project would be quickly realized by the public and contribute to meeting our goals of engaging and involving the public as described in Chapter 9 – Outreach and Community Involvement of the Upper Pecos WBP (pages 85-86).

Restoration Activities

In this project, the Contractor will conduct the following restoration activities according to Figure 3: 1) transplant approximately 200 willow clumps and plant approximately 40 cottonwood trees in eroded areas along a 0.75-mile reach of the Cow Creek Assessment Unit; 2) install woody debris structures and large boulders along the banks of the channel to facilitate the formation of pools, riffles, and bankside microsites, and to protect the bank by directing flow energy back toward the middle of the channel; 3) install crossvanes and scour pools to create refugia for fish; 4) use excavated material from scour pools in select locations to create a narrower channel and introduce sinuosity; 5) grade select areas of the floodplain to minimize flood damage and erosion of bottomlands; and 6) conduct workshops with local landowners to teach them sustainable management practices to reduce sediment-laden runoff into the creek.

Planting/transplanting appropriate native tree and shrub species, such as narrowleaf cottonwood and willow, in open areas along the bank will contribute to a reduction in water temperatures over time as canopy cover develops and the vegetation matures. Revegetation of eroded riparian areas with trees and native herbaceous species will also reduce stream bank erosion and attenuate flood peaks as water spreads and flows across the floodplain. The text on pages 52-53 (Chapter 5 – Management Measures, Restoration Techniques) of the Upper Pecos WBP describes the accrued benefits of planting native trees, shrubs, and riparian plants such as sedges, rushes, and grasses to hold soils and stabilize stream banks.

In-stream Restoration Techniques – Stream channel geometry improvements will include construction and placement of in-stream rock and woody debris structures designed by Riverbend Engineering, which use natural processes to catch sediment and reduce bank shear

stress in areas of the project reach that need it. This will also encourage channel narrowing in areas where the channel has become too wide and shallow and re-establishment of native vegetation in areas that are presently exposed to excessive sunlight. These improvements will have a positive beneficial effect on aquatic habitat diversity (page 52-53, Upper Pecos WBP).

Sediment Control – The benefits of planting vegetation along exposed, eroded stream banks and manipulating channel morphology also extend to more effective control of sediment production, transport, and entrainment is discussed on pages 52-53 of the Upper Pecos WBP. Some of the revegetation and channel restoration techniques that the Contractor will implement in the project area will eventually slow surface runoff and cause overland flows of sediment to slow across the project area's floodplains.

Post-construction monitoring is planned for the summer of 2019 – 2021 on the same timeline as baseline data from 2017-18. These data will be examined at the end of the project and compared to the pre-treatment data from 2017 and 2018 to determine the temperature reduction achieved by the Lower Cow Creek Project and to estimate long-term load reductions in years past the monitoring period.

A.7 Quality Objectives and Criteria for Measurement Data

Question/Decision

The baseline data collection and monitoring components of the Lower Cow Creek Project are intended to answer the following questions: 1) What is the stream temperature load reduction as a result of implementing the Lower Cow Creek Project in the Upper Pecos Watershed? 2) What is the improvement in riparian shade over the creek as a result of implementing the Lower Cow Creek Project in the Upper Pecos Watershed?

Stated as a decision: 1) The information gathered as part of the Lower Cow Creek Project will be used to determine the stream temperature load reduction resulting from implementation of the project. 2) The information gathered as part of the Lower Cow Creek Project will be used to determine the improvement of riparian shade conditions over Cow Creek resulting from implementation of the project.

Data Quality Objective (DQO)

The quality of the data will be adequate to provide a high level of confidence in determining temperature load reduction and changes in the vegetative canopy coverage in the Lower Cow Creek Watershed.

Data Quality Indicators

The measurement quality objectives will be sufficient to achieve the DQO and will be in conformance with those listed in the SWQB's QAPP. The Data Quality Indicators listed in the

SWQB’s QAPP and applicable to the data collected for this project are precision, bias, accuracy, representativeness, comparability, completeness, and sensitivity.

DQI	Determination Methodologies
Precision	In order to obtain agreement among repeated measurements of the same property under similar conditions the same equipment will be used for each survey
Bias	Bias will be reduced by using professional and experienced staff to collect and analyze data
Accuracy	Accuracy will be within the accepted range described in Thermographs SOP 6.3. Spherical densiometer accuracy has been established through Korhonen et. al 2006 to be within an expectable range for use under this project.
Representative	Data collection will be representative of the project area specifically pre- and post-restoration areas
Comparability	This project will collect new data with established quality assurance mechanisms for comparability to other data as appropriate.
Completeness	Data collection will include all parameters at each field survey to ensure completeness and usability of the data.
Sensitivity	Sensitivity of the metrics used will be analyzed during analysis and recalibration of data and instruments

A.8 Special Training/Certification

No special certification is required to implement this QAPP. Baseline data collection and monitoring for this project will be implemented by Pathfinder Environmental with field assistance from UPWA volunteers and technical assistance and oversight from SWQB Project Officer. Pathfinder Environmental has been deploying and collecting the same type of data for other UPWA projects for three years and is now thoroughly familiar with calibration, deployment, data collection, and shade measurement techniques as described in the SWQB SOPs. Volunteer assistance will be trained and supervised at all times by Pathfinder Environmental personnel in the field during deployment and data collection (both temperature and shade) efforts.

A.9 Documents and Records

The Project Officer will make copies of this QAPP and any subsequent revisions available to all individuals on the distribution list.

Project documents include this QAPP, field notebooks, calibration records, validation and verification records, recorded field data, records of analytical data in hard copy or in electronic form, and QC records. Also included are project interim and final reports. All field sheets will be verified before leaving the field, any data captured on a global positioning system (GPS), camera, smart phone, tablet, or laptop will be downloaded to a Pathfinder Environmental computer or an external hard drive at the end of each day. Copies will be made of all data and stored separately from the original data. Data will be submitted to SWQB Project Officer. Data obtained under this QAPP will also be submitted to NMED SWQB for consideration of water quality assessment purposes. These activities will be completed by Devin Kennemore of Pathfinder Environmental.

All digital project data will be kept in a project file on a Pathfinder laptop computer and on a separate external backup hard drive at the Pathfinder Environmental office. The laptop is removed from the Pathfinder Environmental office daily, while the backup drive remains in the office at all times. Hard copy documents, such as field data sheets, will be kept in a project folder in a steel file cabinet in the Pathfinder Environmental office. All hard copy documents will be digitized and stored on a Pathfinder Environmental laptop computer and backup hard drive (see Table 5). All project data will be kept through contract completion and then turned over in full to UPWA for indefinite storage on an UPWA computer. Copies of the data will be distributed by Pathfinder Environmental to NMED SWQB Project Officer at the end of the project in 2021.

Table 5. Data Records for the Lower Cow Creek Project

Document	Form	Field Sheet Used
QAPP	Electronic (.doc) & Hard Copy	N/A
Calibration Records	Electronic (.doc) & Hard Copy	N/A
Thermograph Deployment Form	Hard Copy	https://www.env.nm.gov/swqb/SOP/documents/6.4SOP-ThermographDeploymentFieldSheet17DEC2015.xls
Temperature Data	Electronic Excel Files and HOBOWare files	N/A
Temperature Effectiveness Analysis	Electronic Excel Macro files	Ancovinator & Thermonator Excel forms. Available from Dan Guevara, NMED SWQB
Canopy Cover Data	Electronic (.xls) & Hard Copy	https://www.env.nm.gov/swqb/documents/swqbdocs/MAS/SOP/5.0SOP-HabField+UploadForms_August13_sm.xls
Photos	Electronic (.jpg)	N/A
Interim and Final Reports	Electronic (.doc) & Hard Copy	N/A

Group B: DATA GENERATION AND ACQUISITION

B.1 Sampling Design

Waterbody attributes and monitoring station locations for the Lower Cow Creek Project are presented in Tables 6 and 7, respectively. Figure 4 shows the locations of the thermograph stations on Lower Cow Creek in the Cow Creek watershed.

Table 6. Waterbody Attributes for the Cow Creek Project

Waterbody	Assessment Unit ID	12-Digit HUC	12-Digit HUC Name
Cow Creek	NM-2214.A_090	130600010104	Lower Cow Creek

Table 7. Lower Cow Creek Project Monitoring Stations established for the project

Station	Location	Monitoring
Lower Cow Creek Upper	Approximately 0.35 mile upstream from the bridge over Cow Creek and adjacent to the Michels property on river right	Temperature
Lower Cow Creek Middle	Centered under the bridge over Cow Creek in the middle of the project area	Temperature
Lower Cow Creek Lower	Approximately 165 feet downstream from the acequia diversion dam at the lower end of the project area	Temperature

Temperature monitoring will be conducted at locations representative of ambient stream conditions, generally in the transitional area between a riffle/run and a pool, or at the toe of a pool, rather than in shallow riffles or deep pools.

The field season is between June 1 and September 30 of each year. All baseline data collection and monitoring will occur during this time.

All monitoring sites are located on privately owned property with written access permission from the landowners; therefore, unlike projects on public lands, the sites will always be accessible.

B.2 Sampling Methods

This study is intended to measure temperature using recording data loggers. Temperature data logger deployment will be carried out in accordance to the SWQB QAPP using *NMED SWQB SOP 6.3 Thermographs* (NMED/SWQB 2016c). Water temperature will be collected with HOBO Water Temp Pro v2 data loggers (accuracy +/-0.2 °C, resolution 0.02 °C). Data from the data loggers will be downloaded via shuttle approximately every 30 days following deployment to minimize the chance of data losses associated with stochastic events (flooding). Data will be reviewed on a laptop in the field immediately after downloading to identify potential data download problems and take corrective action before leaving the project site. This field data

review will also serve to ensure proper functioning and placement of the temperature data loggers, thus providing the opportunity to address such issues while time remains to correct them before the end of the data collection season.

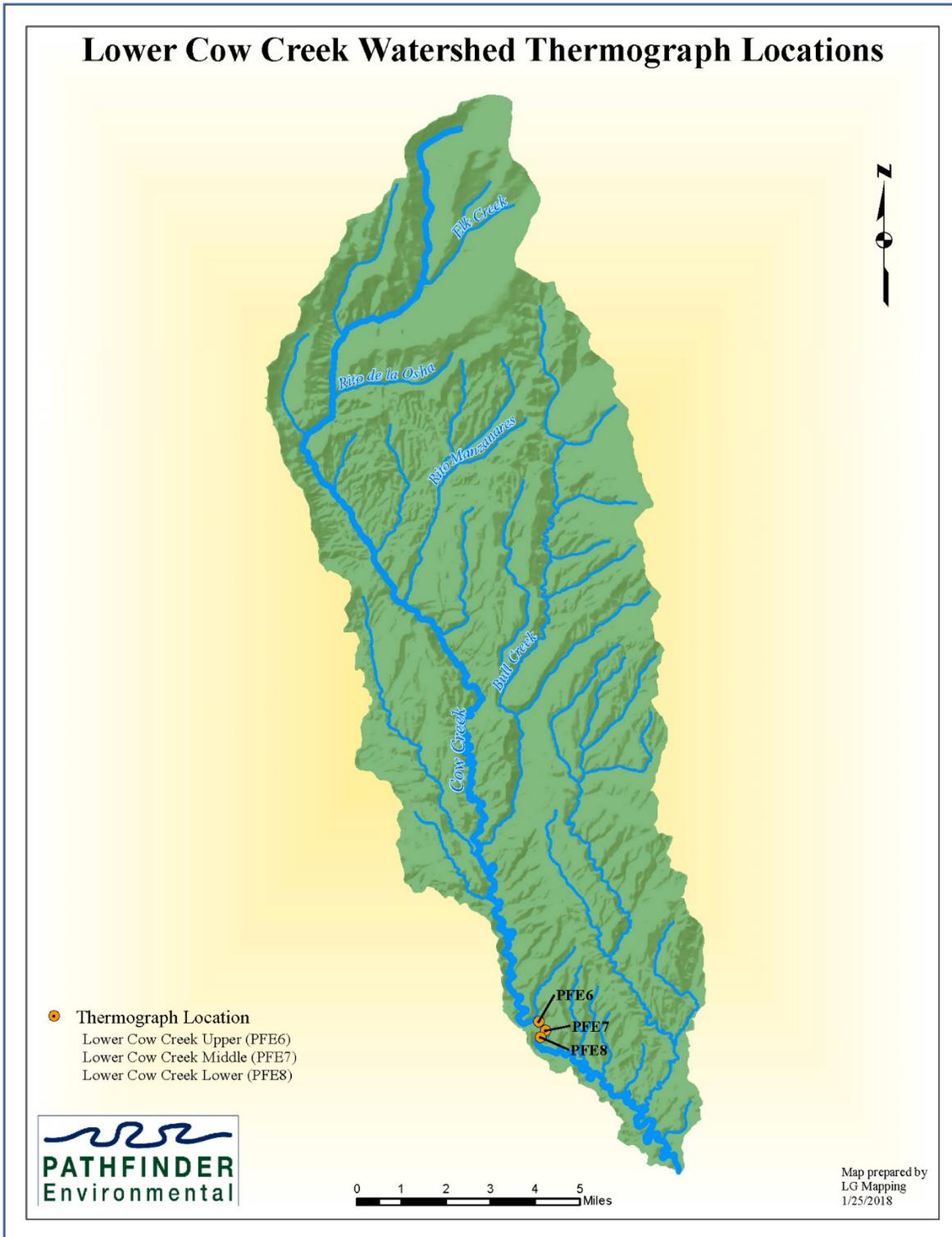


Figure 4. Project Area and Monitoring Stations

Percent canopy cover measurements will be carried out within the project area in accordance with NMED SWQB’s SOP 5.0 Physical Habitat Section 6.3.3 pertaining to Percent Canopy Cover (NMED/SWQB 2016d).

There are no plans to collect samples that would require outside analysis.

Table 8. Data Types for the Cow Creek Project

Metric	Method	Tolerances (if applicable)
Temperature	NMED SWQB SOP 6.3 Thermographs	accuracy +/-0.5 °C, resolution 0.02 °C
Canopy Cover	NMED SWQB SOP 5.0 Physical Habitat Section 6.3.3 Bankfull Cross-Section, Stream Flow, and Percent Canopy Cover	

B.3 Sample Handling and Custody

Because there are no plans to collect samples for laboratory analysis, there are no handling requirements.

B.4 Analytical Methods

Because there are no plans to collect samples, no analytical methods are needed.

B.5 Quality Control

Temperature quality control will be assured by verifying deployment locations are well submerged and not subject to erroneous air temperature readings. Loggers will also be checked for accuracy prior to deployment in, and retrieval from, the field as described in the Bureau SOP (NMED/SWQB 2016c).

Canopy coverage has the greatest potential for observer error and bias. Quality control will be strengthened by following the procedures described in Section 6.3.3 pertaining to percent canopy cover of SWQB Bureau SOP 5.0 and having the same observer take measurements at each location. This reduces the bias affect and increases the precision of each measurement.

The chief source of data is measurements of temperature using data loggers. The QC activities relating to data logger measurements are described in Sections B.6 and B.7 below.

B.6 Instrument/Equipment Testing, Inspection and Maintenance

The primary equipment needing maintenance, testing, and inspection are temperature data loggers. Hobo Water Temp Pro V2 data loggers will be tested before and after each field season according to SOP 6.3 section on Thermograph Calibration Verification. The spherical densiometer will be inspected prior to use by the Technical Consultant, Devin Kennemore.

B.7 Instrument/Equipment Calibration and Frequency

It should be possible to show that all data was collected with monitoring devices that can be shown to have been properly calibrated. For this project, specific calibration requirements apply to temperature data loggers. The spherical densimeter does not require calibration other than inspection by field personnel prior to each use. The calibration of temperature data loggers will be checked annually (before deployment and after retrieval) using the methodology described in Section 6.4 of the NMED SWQB SOP 6.3 (NMED/SWQB. 2016c). Documentation of calibration and verification will be maintained by Technical Consultant, Devin Kennemore at the Pathfinder Environmental office.

B.8 Data Acquisition Requirements

Baseline data was collected during the summer of 2017 under the supervision of NMED SWQB staff and the NMED SWQB QAPP. No other outside data was acquired for this project.

B.9 Inspection/Acceptance for Supplies and Consumables

There are no supplies or consumables that could affect the quality of data related to this project.

B.10 Data Management

The UPWA Project Manager, Douglass C. Jeffords, will be responsible for data management. Data will be sent to the Project Officer, John Money, and will be stored on his computer and on a SWQB network drive.

All data will be converted to electronic format; hard copies of field sheets will be maintained in a project binder by Pathfinder Environmental. Electronic data will be organized by assessment and date and will be stored and backed up on Pathfinder Environmental and UPWA computers and external backup hard drives, respectively.

Group C: ASSESSMENT AND OVERSIGHT

C.1 Assessment and Response Actions

The Project Officer will provide project oversight by periodically assisting with and/or reviewing data collection efforts. A review of the baseline data collection and monitoring efforts by the Project Officer will take place at the end of each monitoring season. The Project Officer will assess project progress to ensure the QAPP is being implemented, including periodic audits by the QAO, as needed. Any problems encountered during the course of this project will be immediately reported to the Project Officer who will consult with appropriate individuals to determine appropriate action. Should the corrective action impact the project or data quality, the Project Officer will alert the Quality AO. If it is discovered that monitoring methodologies must deviate from the approved QAPP, a revised QAPP must be approved before work can be continued. All problems and adjustments to the project plan will be documented in the project file and included in the final report.

Temperature data will be assessed by the Pathfinder Environmental Technical Consultant, Devin Kennemore, according to the guidelines laid out in *Procedures for Assessing Water Quality Standards Attainment for the State of New Mexico 303(d)/305(b) Integrated Report: Assessment Protocol* (NMED/SWQB 2017). Data will be analyzed in using Microsoft Excel and SSTEMP (Bartholow 2002).

C.2 Reports to Management

Quarterly reports will be submitted by the UPWA Project Manager, Douglass C. Jeffords, to the Project Officer and will include progress of project implementation and any available data. Printouts, status reports or special reports for SWQB or EPA will be prepared upon request. The final report will be submitted to the SWQB Project Officer by the end of the grant period as indicated in the final, signed Intergovernmental Agreement. The Project Officer will be responsible for submitting the final project deliverables to EPA under this grant.

Group D: DATA VALIDATION AND USABILITY

D.1 Data Review, Verification and Validation

Data will be reviewed by the contractor prior to demobilization from the field site. Data will be considered usable if the requirements of this QAPP were followed and the data is within acceptable range limits as defined under this QAPP. Data that appears incomplete or questionable for the parameter will be flagged for review. Flagged data will be discussed with the Project Officer to determine the potential cause and usability. If a reasonable justification for use of the data cannot be attained, those data will be not used in analysis and implementation of restoration activities unless the data can be recollected and assessed for usability.

D.2 Validation and Verification Methods

The Project Officer will ensure that valid and representative data are acquired. Verification of field sampling and analytical results as performed by the Project Officer, will occur in the review of data. In the event questionable data are found, the Project Officer will consult with project personnel to determine the validity of the data. Results of the verification process will be included in the final reports. Data verification procedures will be used by Technical Consultant, Devin Kennemore, and reviewed by the Project Officer, as described in Section 6.4 Long Term Deployment (LTD) Data of the NMED SWQB (2016e) SOP.

D.3 Reconciliation with User Requirements

The user requirement is a restatement of the data quality objective: The quality of the data will be adequate to provide a high level of confidence of determining whether the Cow Creek Project is meeting the project goals, as stated in the approved scope of work. If the project's results do not meet this requirement, then additional monitoring may be necessary to fill in data, which may include an extension of the monitoring period to measure effects that were not apparent during the project period. This would require a contract extension from NMED SWQB.

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APPENDIX

Acknowledgement Statement



New Mexico Environment Department Surface Water Quality Bureau

**Temperature Reduction and Erosion Reduction in
Lower Cow Creek
Quality Assurance Project Plan Acknowledgement
Statement**

This is to acknowledge that I have received a copy (in hard copy or electronic format) of the Temperature Reduction and Erosion Reduction in Lower Cow Creek *Quality Assurance Project Plan*.

As indicated by my signature below, I understand and acknowledge that it is my responsibility to read, understand, become familiar with and comply with the information provided in the document to the best of my ability.

Signature

Kyla Chandler

Name (Please Print)

Date

Return to SWQB Project Officer (John Moeny)

SCOPE OF WORK

Temperature Reduction and Erosion Reduction in Lower Cow Creek

A. Project Title

Temperature Reduction and Erosion Reduction in Lower Cow Creek

B. Start and End Dates

All project work will begin within one month following notification by the Agency that the final signatures to the Contract / Intergovernmental Agreement Award have been executed and The Contractor is issued a notice to proceed. The Contractor also understands (as per Section IV. C. of RFP# 70-667-16-27546), and agrees that project terms initially proposed cannot exceed four years in duration; however, under unusual circumstances an extension may become necessary. In such a case, the contract may exceed four years. The beginning date will not be earlier than September 1, 2017. The end date will be December 31, 2021.

C. Watershed-Based Plan Citation

The Watershed-Based Plan (WBP) titled *Upper Pecos Watershed Protection and Restoration Plan* was submitted to the Surface Water Quality Bureau (SWQB) of NMED and the US Environmental Protection Agency (EPA) for review in 2012.³ EPA's Region 6 office accepted the plan on December 11, 2012.⁴

The goal of this plan is to reduce and eliminate water pollution by implementing focused restoration projects and other land management activities and conducting education and outreach to remove the Pecos River and its tributaries from the list of impaired waters. Printed copies of the WBP are available for review at the Upper Pecos Watershed Association's office in Pecos, New Mexico, during normal business hours (Monday through Wednesday). An electronic copy of the same plan is available for review at:

<https://www.env.nm.gov/swqb/wps/WBP/Accepted/Pecos/Upper>.

D. Problem Statement

Attachment A of RFP# 70-667-16-27546 lists the Pecos Headwaters Watershed (13060001), Cow Creek (Pecos River to Bull Creek) (AU_ID: NM-2214.A_090) for temperature impairment. The 2016-2018 Clean Water Act Section §303(d)/§305(b) Integrated Report recognizes three stream segments in the upper Pecos watershed as being impaired for temperature (Table 1) with the probable sources of impairment including: highway/road/bridge runoff (non-construction related), loss of riparian habitat, rangeland grazing, stream bank modifications/destabilization, and watershed runoff following forest fire.

Table 1. Temperature impaired stream segments in the Upper Pecos watershed

Impaired stream segments	Cause for impairment
Cow Creek (Bull Creek to headwaters) 22.3 miles length	Temperature
Cow Creek (Pecos River to Bull Creek) 15.6 miles length	Temperature
Pecos River (Cañon de Manzanita to Alamos Canyon) 5.7 miles length	Temperature

Designated uses of perennial reaches of Cow Creek and all perennial reaches of its tributaries and the main stem of the Pecos river from Cañon de Manzanita upstream to its headwaters (20.6.4.217 NMAC) include: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact; and public water supply on the main stem of the Pecos River (SWQB, 2016-2018 State of New Mexico US EPA-Approved CWA §303(d) / §305(b) Integrated List).ⁱⁱⁱ Page 28 of the Upper Pecos WBP cited above provides more information on the water quality problem for the lower reach of Cow Creek.

E. Goal

The lower reach of Cow Creek (Pecos River to Bull Creek, AU NM-2214.A_090) is 15.57 miles long. The overarching goal of this project is to implement management measures that will contribute to reduced water temperature at the lower end of an approximately 1.1-mile-long segment of this lower reach of Cow Creek and contribute to the temperature load reduction goals for the upper Pecos watershed outlined in the 2005 Pecos Headwaters TMDL (Table 2).^{iv}

Table 2. Needed temperature reductions and increases as calculated from the 2005 Pecos Headwaters TMDL

Stream reach	Reduction in max. temp.	Shade increase	Load reduction (j/m ² /s)
Cow Creek (Bull Cr. to headwaters)	0.9 degrees C.	8%	17.61
Cow Creek (Pecos River to Bull Cr.)	2.5 degrees C.	25%	48.71
Pecos River (Alamos Cr. to Cañon de Manzanita)	5.5 degrees C.	39%	100.84

For the Cow Creek (Pecos River to Bull Creek) Assessment Unit, the water quality standard for temperature is achieved when the percent total shade is increased to 61% although the actual Load Allocation (which includes a margin of safety) of 73.0 j/m²/s is achieved when shade is further increased to 65%. This project proposes to implement restoration on a segment that comprises 7% of the total reach length.

Thus, our goal for this project is to increase canopy cover along a 0.75-mile long segment of Cow Creek (Pecos River to Bull Creek) by 8% and to produce an estimated reduction in temperature of 0.07 °C by 2020. In the longer term, the project is expected to produce a total canopy cover increase within the 0.75-mile segment of 25%. Future projects upstream and downstream along this lower reach of Cow Creek would eventually combine with this one to achieve the desired goal for the entire reach of a 2.5 °C temperature reduction. This stated goal might not be achieved until the planted vegetation along the reach matures and develops a full canopy; however (all other factors being held constant), the Contractor anticipates some measurable progress will be made by 2020 that demonstrates a trend towards achievement of the temperature reduction goal. If the temperature modeling is correct, the anticipated increases in canopy cover and shade will certainly achieve the stated goal in water temperature reductions over a longer time frame of 10 to 15 years.

Agriculture and livestock grazing have significantly affected regrowth of naturally occurring vegetation in the project area. A significant component of this project involves conducting workshops with local landowners, who support this project, to show them how they can better manage their land to reduce erosion and improve water quality in this segment of Cow Creek. Initial discussions with these landowners indicates a strong desire to better understand the interaction between their land management practices and the creek.

F. Project Area

The project area is located entirely on private land along a 0.75-mile segment of the Cow Creek Assessment Unit (Pecos River to Bull Creek, NM-2214.A_090), upstream of North San Ysidro, NM, within the 12-digit Hydrologic Unit Code (HUC) number 130600010104 (Figure 1). This priority reach is near the lower end of approximately 15.57 impaired stream miles in total (2016-2018 Clean Water Act Section §303(d)/§305(b) Integrated Report). This Assessment Unit encompasses 22,253 acres in total. The project area consists of approximately 0.75 mile of Cow Creek and approximately 9 acres of land area, assuming a 100-foot corridor width where the project will be implemented (Figure 2).

From a qualitative standpoint, this reach is in "good" to "fair" condition in most locations. Entrenchment to bedrock is common throughout the project area. Riverbank erosion is scattered and unevenly distributed, with most occurring in the lower half of the project area. Shade over the stream is good in most places, although frequently threatened by erosion and absent in areas with the highest degrees of erosion. Heavy grazing and agricultural practices continue to plague this reach of the creek. Local landowners have taken significant measures to protect the stream bank in a number of locations, but these "fixes" have subsequently led to unanticipated consequences downstream.

The Contractor's rationale for selecting this project was based on three considerations: First, our goal is to implement and complete an on-the-ground

project that achieves some measure of water-temperature load reduction in the Cow Creek Assessment Unit as described in Chapter 5 – Management Measures, Restoration Techniques (pages 52-54) of the Upper Pecos WBP. The second consideration is to implement a project that will improve riparian habitat in the near-term (within the 4-year project life) and to use the project to showcase and promote the use of similar restoration techniques to landowners along the Pecos River and Cow Creek in future public outreach and education work. Third, the Cow Creek project area is a prime example of an area where the benefits of the proposed restoration would serve as a demonstration and model for other landowners upstream and downstream within the Assessment Unit. The benefits of reducing erosion along this reach using the techniques described in the Upper Pecos WBP and employed by this project would be quickly realized by the public and contribute to meeting our goals of engaging and involving the public as described in Chapter 9 – Outreach and Community Involvement of the Upper Pecos WBP (pages 85-86).

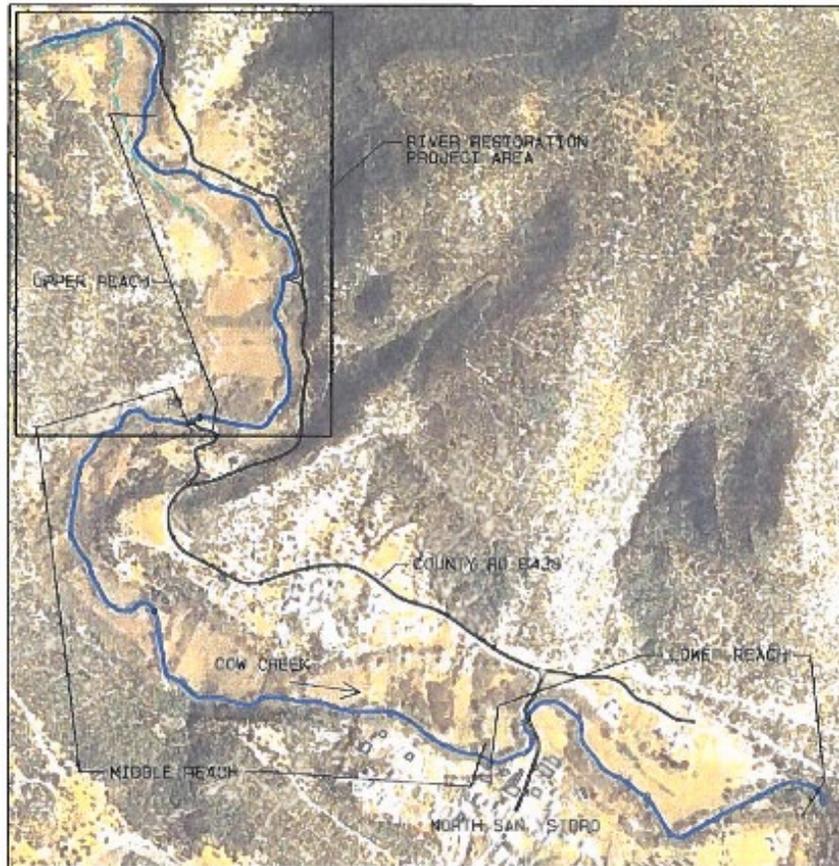


Figure 1. Lower Cow Creek Project Area

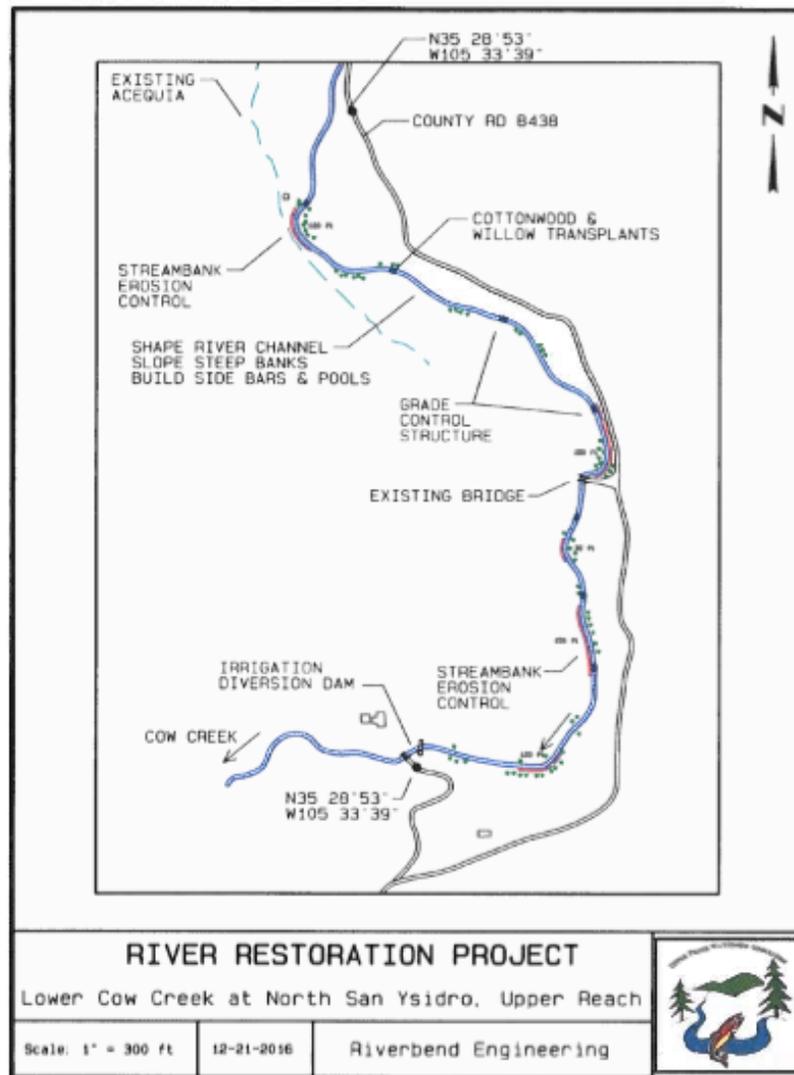


Figure 2. Schematic of proposed restoration areas in the lower Cow Creek project area (Riverbend Engineering, LLC). Green dots = revegetation; Red lines = in-stream restoration

G. Management Measures

In this project, the Contractor will: 1) transplant approximately 200 willow clumps and plant approximately 40 cottonwood trees in eroded areas along a 0.75-mile reach of the Cow Creek Assessment Unit (Figure 2); 2) install woody debris structures and large boulders along the banks of the channel to facilitate the formation of pools, riffles, and bankside microsites, and to protect the bank by directing flow energy back toward the middle of the channel; 3) install crossvanes and scour pools to create refugia for fish; 4) use excavated material from scour pools in select locations to create a narrower channel and introduce sinuosity; 5) grade select areas of the floodplain to minimize flood damage and erosion of bottomlands; and 6) conduct workshops with local landowners to teach them sustainable management practices to reduce sediment-laden runoff into the creek.

Planting/transplanting appropriate native tree and shrub species in open areas along the bank will contribute to a reduction in water temperatures over time as canopy cover develops and the vegetation matures. Revegetation of eroded riparian areas with trees and native herbaceous species will also reduce stream bank erosion and attenuate flood peaks as water spreads and flows across the floodplain. The text on pages 52-53 (Chapter 5 – Management Measures, Restoration Techniques) of the Upper Pecos WBP describes the accrued benefits of planting native trees, shrubs, and riparian plants such as sedges, rushes, and grasses to hold soils and stabilize stream banks.

In-stream Restoration Techniques – Stream channel geometry improvements will include construction and placement of in-stream rock and woody debris structures designed by Riverbend Engineering, which use natural processes to catch sediment and reduce bank shear stress in areas of the project reach that need it. This will also encourage channel narrowing in areas where the channel has become too wide and shallow and re-establishment of native vegetation in areas that are presently exposed to excessive sunlight. These improvements will have a positive beneficial effect on aquatic habitat diversity (page 52-53, Upper Pecos WBP).

Sediment Control – The benefits of planting vegetation along exposed, eroded stream banks and manipulating channel morphology also extend to more effective control of sediment production, transport, and entrainment is discussed on pages 52-53 of the Upper Pecos WBP. Some of the revegetation and channel restoration techniques that the Contractor will implement in the project area will eventually slow surface runoff and cause overland flows of sediment to slow across the project area's floodplains.

H. Key Persons and Coordination, Roles, and Responsibilities

The following people will play key roles on this project:

Mr. Douglass C. Jeffords, P.E. and Upper Pecos Watershed Association (UPWA) President. Mr. Jeffords will serve as the Project Manager for the Contractor, with assistance and support from the UPWA Board of Directors. He will be responsible for project guidance, oversight, and implementation. Mr. Jeffords served as Project

Manager for UPWA's previous Section 319 CWA grants as well a Forest Service's Collaborative Forest Restoration Program (CFRP) grant, and its Dalton Day Use NM River Stewardship Grant. He is a retired US Navy Captain and a Civil and Structural Engineer. He has considerable experience in planning and implementing large-scale projects and is committed to improving the Pecos watershed through this grant. Mr. Jeffords may be reached by phone at: (505) 757-2342 or (505) 699-1235; or email at: dcjeffords@aol.com.

Ms. Reina Fernandez will serve as Financial Coordinator for this project and will provide accounting, federal grant administration, and implementation oversight. Ms. Fernandez presently serves as Administrator to the UPWA and is familiar with contract administration requirements for UPWA's previous 319 grants. Ms. Fernandez has over seven years experience in administration working for the Forest Guild and will work closely with Mr. Jeffords and the UPWA Board of Directors to ensure that all of this project's financial records, reporting, and use of funds related to this project are accurate and timely.

Mr. Chris Phillips, P.E. (Riverbend Engineering, LLC) (subcontractor) will serve as the Project Coordinator and will be responsible for conducting all project designs, related CWA Section 404/401 permitting, overseeing the acquisition of plant materials and work of construction sub-contractors, and completing post-construction Section 404 permit requirements. Mr. Phillips has previously designed and constructed several projects for the Contractor including the above mentioned "on the ground" projects.

Mr. Devin Kennemore (Pathfinder Environmental, LLC) (subcontractor) will serve as Environmental Coordinator and will complete all environmental compliance and monitoring for this project. Mr. Kennemore has over 25 years of experience in environmental permitting and compliance and is currently fulfilling the monitoring requirements for UPWA's current 319 grant for a project on upper Cow Creek. Mr. Kennemore will also donate some time as an expert volunteer for this project.

The following individuals have agreed to provide in-kind match contributions (see Budgets in Section 2). They will not be subcontractors to the Contractor, but will be closely involved in this project:

Mr. Elias Gonzales, a local landowner, will be donating willows for the project.
Ms. Paulene Michels, a local landowner, will be donating time coordinating with local landowners for conducting the workshops.

Other local landowners will be providing volunteers for revegetation work.

The following individuals and organizations have agreed to provide assistance and will be closely involved in this project. These organizations and individuals are not subcontractors to the Contractor under this contract:

- Truchas Chapter Trout Unlimited will provide technical assistance in reviewing the draft QAPP, will review our draft project monitoring report, and provide volunteers to assist with “on the ground” project work.
- Mr. Kenneth Alcon, Natural Resources Conservation Service, will provide technical assistance in reviewing the draft QAPP and will review our draft project monitoring report for technical sufficiency.
- Ms. Frances Martinez, Director, Tierra y Montes Soil and Water Conservation District, will provide personnel and technical assistance in reviewing the draft QAPP and final draft project monitoring report.
- New Mexico Department of Game and Fish will provide electrofishing survey data for the project.

Measures of Success and Performance

An achievement-based monitoring program will be used to determine if an increase in canopy cover of 8% and a load reduction of 0.07 degree Celsius in water temperature are achieved. Restoration implementation milestones and achievement criteria are summarized in Table 3 and follow those described in Chapter 8 - Achievement Criteria, Milestones, and Monitoring, Achievement Criteria, pages 80 – 83 of the UPWA WBP.

Table 3. Measurable Milestones

Indicator	Milestone or criterion
Stream/riparian project undertaken and completed	Project schedule in Watershed-Based Plan
Vegetation development in completed project	Appropriate increases in vegetation canopy cover, density, height, vigor, and/or canopy closure as compared to pre-treatment conditions and project-specific desired conditions
Water temperature in temperature-impaired stream	Measured to be within standards (<i>achievement criterion</i>)

Temperature - Water temperature will be monitored from the end of May through the end of September using small temperature sensors (HOBO Water Temperature Pro v2 Data Loggers – U22-001 or similar) to record water temperatures every 15 minutes and to provide a temperature log that can be periodically downloaded to a computer on a monthly basis. At least three sensors will be deployed in the stream; one above, one just below, and one in the middle of the project area.

Channel Morphology - Channel cross sections will be recorded along the stream prior to construction and again after construction to demonstrate the success of the channel manipulation techniques applied to the creek.

Canopy and Shade - Changes in canopy cover and shade will be measured during the growing season using both a spherical densiometer and a digital camera.

Photographs will be taken at established photopoints to allow us to make valid comparisons over time; and will be taken before and after additional vegetation is planted or other restoration work begins.

Quality Assurance Project Plan (QAPP) - Prior to initial data collection, UPWA will develop a Quality Assurance Project Plan (QAPP) for the project and submit a draft of this document to the SWQB for review and comment before our project is implemented. The final plan will describe how we collect, record, and evaluate monitoring data, and how we will review our monitoring protocols on a regular basis.

I. Implementation Plan and Schedule

Table 4 at the end of this section provides a list of tasks with their estimated start and completion dates.

Task 1: Project Management – UPWA Project Manager, Douglass Jeffords will be responsible for engaging subcontractors and consultants, and interacting with collaborators, agency personnel, and private landowners. He will also conduct project management/oversight/ coordinating activities with the assistance of the UPWA Board of Directors and the NMED Project Officer and will provide timely updates on progress successes in implementation of the project. This task will be completed when the 4-year contract term expires.

Deliverables will include: Project quarterly reports and final report as noted below in Project Administration.

Expected task start date and completion: This task will start upon contract execution and notice to proceed from NMED and will be completed at the end of the contract term.

Task 2: Project Administration and Reporting – UPWA Project Administrator, Reina Fernandez will be responsible for maintaining proper records as outlined in Appendix E of the NMED RFP#70-667-16-27546 and maintaining a detailed budget that distinguishes between cost-match dollars, in-kind services, and invoices to be reimbursed from the grant. She will also submit expenditure requests per the format of Appendix D of the NMED RFP#70-667-16-27546, and will, with the Project Manager, maintain the project record as well as records of all in-kind service matches and cash contributions. This task will be completed when the contract term expires.

Deliverables will include: 1) Submitting a final report and all required quarterly reports in a timely manner to NMED on a quarterly basis per Chapter II, Section D, Paragraph 6 of the NMED RFP#70-667-16-27546, Reports; 2) Submitting requests for Expenditure/Request for Funds; and 3) Ensuring supporting documentation for all reported expenditures are valid, based upon official accounting records (books of account) and consistent with the terms of the contract between UPWA and NMED.

Quarterly reports will include the following elements: status of each project task, expenditures by task from the grant funds and in-kind matches, and reports of work progress or setbacks by task. The first of these reports will be submitted at the end of the first quarter following receipt of a fully executed contract and notice to proceed.

Expected task start date and completion: This task will start upon contract execution and notice to proceed from NMED and will be completed at the end of the contract term.

Task 3: CWA Compliance - Project Coordinator/Project Engineer, Chris Phillips will be responsible for obtaining a CWA Section 401/404 certification/permit from the SWQB and the US Army Corps of Engineers and preparing supporting documentation for these permits before the project is implemented. He will also be responsible for providing any post-construction data required by the 404 permit.

Deliverables will include: 1) Identifying agency requirements and submitting permit applications with appropriate documentation, and 2) coordinating with agencies and sub-contractors to ensure that the terms and conditions of these permits are met.

Expected task start date and completion: This task will start upon contract execution and notice to proceed from NMED and will be completed at the end of the contract term.

Task 4: Development of QAPP - Devin Kennemore, Pathfinder Environmental, LLC, will be responsible for the preparation of a Quality Assurance Project Plan (QAPP) for this project. Mr. Kennemore will work with Douglass Jeffords and other members of the project team involved in the implementation of the project to "systematically plan" what needs to be done to successfully complete the project and the quality assurance measures that will be necessary to ensure accurate data collection and analysis. Mr. Kennemore will then write a draft QAPP for agency review and approval.

Deliverables will include: 1) project team meeting for systematic planning, 2) preparation and submittal of a draft QAPP to the SWQB for review/approval, 3) incorporating comments into the QAPP, 4) updates to the QAPP as necessary for the duration of the project.

Expected task start date and completion: This task will be completed within three months of a fully executed contract between UPWA and NMED. If a contract is in place between UPWA and NMED by August 31, 2017, then the QAPP will be completed by November 30, 2017.

Task 5: Environmental Baseline Data Collection and Post-Implementation Monitoring - Devin Kennemore, Pathfinder Environmental, LLC, will be responsible for planning and conducting field surveys to collect pre-construction

baseline environmental data for water temperatures, photo-monitoring, and shading conditions and post-construction environmental monitoring.

Deliverables will include: 1) a pre-project baseline conditions report, 2) quarterly monitoring results to be included in the quarterly reports to NMED, and 3) a final post-project monitoring report that evaluates the success of the project for water temperature reduction and shade development.

Expected task completion: It will be necessary to begin collecting water temperature data as early as possible for this project; therefore, to obtain thermograph data during the 2017 summer, Mr. Kennemore will coordinate with staff at NMED to install thermographs in the creek at the beginning of the season. Mr. Dan Guevara of NMED has offered this assistance when contract execution is expected to occur after the field season is underway. Pre-construction shading measurements will occur in 2017 prior to the end of the field season. This task will be ongoing throughout the 4-year contract period and will end in 2020 at the end of the contract period.

Task 6: Biological and Archaeological Surveys and Reporting- Devin Kennemore, Pathfinder Environmental, LLC, will be responsible for planning and conducting a biological survey and preparing the associated report for Clean Water Act Section 404 permitting. He will also be responsible for obtaining archaeological surveys and reports as required by the US Army Corps of Engineers for the CWA Section 404 permit and the NMED for CWA Section 401 certification.

Deliverables will include: 1) a biological survey report for the project area; 2) an archaeological survey report and associated forms as required for the CWA Section 404 permit. This work assumes no sites will be found and a negative report.

Expected task start date and completion: Assuming contract execution by August 31, 2017, this task will start on September 1, 2017 and be completed as soon as possible in order to facilitate completion of the CWA Section 401 and 404 permitting in time for construction to begin and be completed before the 2018 data collection field season.

Task 7: Design, Management, and Construction Management of the Cow Creek On-The-Ground Implementation Project - Chris Philips, Riverbend Engineering, LLC, will be responsible for preparing the preliminary and final designs for the project, including in-stream structures and revegetation work. This will include the preparation of contract specifications and documents for all construction contracts. Mr. Philips will prepare the application documents for the CWA 401 & 404 permits. Mr. Philips or his technical staff will provide oversight of the construction contractor during the implementation phase. Following construction, Mr. Philips will collect any post-construction data as required by the 404 permit for post-construction reporting.

Deliverables will include: 1) final designs for the project, 2) 404 & 401 Permit application documents, 3) contract specifications and bid documents, and 4) oversight and documentation of the construction contractor's compliance with the bid document requirements.

Expected task start date and completion: This task will begin upon contract execution and notice to proceed, assumed September 1, 2017 and will be completed by December 31, 2018.

Task 8: Provide and install the following project quantities of plant materials - Chris Philips, Riverbend Engineering, LLC, will oversee the efforts of a construction contractor, including the purchase and installation of cottonwood trees and willow transplants in the project area.

Deliverables will include:

- Approximately 40 cottonwood trees
- Approximately 200 willow clump transplants (each clump transplant is approximately the size of a small backhoe bucket. These are developed willows too large to be hand dug, not a willow whip).

Expected task start date and completion: This task will start and be completed within 12 months after completion of all pre-construction baseline data collection and permitting environmental compliance requirements.

Task 9: Seed and mulch in restoration areas – The construction contractor will be responsible for furnishing riparian grass seed, and placement of that seed and mulch in the project area. The construction work will be overseen by Mr. Chris Philips of Riverbend Engineering, LLC or his designated staff member.

Deliverables will include:

- Furnish and install riparian grass seed and mulch in approximately 1.5 acres of riparian zone

Expected task start and completion: concurrent with the rest of the construction effort.

Task 10: Installation of woody debris structures and boulders/crossvanes in the Creek – The construction contractor will be responsible for the construction of in-stream woody debris structures as shown in the construction plans. These structures will be strategically placed in areas where they are needed. Woody debris structures will consist of tree trunks with root wad attached. The trunks will be buried pointing downstream in the stream bank or in the ground adjacent to the stream bank. Their purpose is to protect the stream bank and floodplain until natural processes replace them with sediment and vegetation. The construction

work will be overseen by Mr. Chris Philips of Riverbend Engineering LLC or his designated staff member.

Deliverables will include:

- Construction of approximately 35 woody debris structures and crossvanes, using on-site materials, as shown on the plans.

Expected task start and completion: Winter of 2017-2018 or spring of 2018.

Task 11: Landowner workshops – One or two workshops will be held, as necessary, with the local landowners to educate them on the management measures that will be implemented with this project, how these management measures will improve water quality and the stream habitat, what the benefits will be to them, and what they can do to ensure the long-term success of the project. These workshops will be coordinated by UPWA with volunteer assistance from UPWA partners and will be conducted on-site.

Deliverables will include:

- One or two workshops, as necessary, with the local landowners.

Expected task start and completion: September 1, 2017 through September 1, 2018.

Table 4. Project Implementation Schedule (Assumes pre-contractual voluntary baseline monitoring in 2017 under NMED QAPP and start date of September 1, 2017)

Task	Approximate Start Date	Approximate Completion Date
1. Project Management	September 1, 2017	December 31, 2020
2. Project Administration and Reporting	September 1, 2017	August 31, 2020
3. CWA Compliance	September 1, 2017	December 31, 2017
4. Development of QAPP	September 1, 2017	November 30, 2017
5. Environmental Baseline Data Collection and Post-Implementation Monitoring	September 1, 2017	August 31, 2020
6. Biological and Archaeological Surveys and Reporting	September 1, 2017	November 30, 2017

Task	Approximate Start Date	Approximate Completion Date
7. Design, Management, and Construction Management	September 1, 2017	May 31, 2018
8. Provide and Install Plants	February 1, 2018	May 31, 2018
9. Seed and Mulch in Restoration Areas	February 1, 2018	May 31, 2018
10. Installation of Woody Debris Structures, Boulders, and Crossvanes	February 1, 2018	May 31, 2018
11. Landowner workshops	September 1, 2017	September 1, 2018

Match

All of the proposed match is in the form of in-kind donations of time by volunteers who want to see the project implemented. This match will consist of time donated for project management, public outreach, executive oversight, quality control/quality assurance, QAPP development, monitoring assistance, and revegetation labor. Additional match will be provided in the form of donated willow clump stock for planting in the riparian zone of Cow Creek.

Budget

Budget Category	Contract Funds (Section 319)	In-Kind Match (Non-Federal)
Personnel		
Project Administrator (Reina Fernandez, \$25/hr)	\$ 9,400.00	
Project Management (Doug Jeffords, \$75/hr)		\$ 30,000.00
UPWA Board of Directors (\$40/hr/member)		\$ 27,200.00
Expert Volunteers - QA/QC & fish surveys (\$65/hr)		\$ 20,800.00
Community Volunteers (\$18/hr)		\$ 3,600.00
Equipment		
Three HOBO Water Temperature Pro V2 Data Loggers - U22-001	\$ 405.00	
Laptop computer for field data collection		\$ 400.00
Travel		
Mileage reimbursement (\$0.535/mi)	\$ 600.00	
Mileage match (\$0.535/mi)		\$ 200.00
Supplies		
Offsite plant materials (Riverbend)	\$ 3,000.00	
Supply large rocks, riprap rock, & dead trees (Riverbend)	\$ 24,920.00	
Willows from local private property (\$80/clump)		\$ 16,000.00
Contractual		
Pathfinder Environmental, LLC (Devin Kennemore, \$75/hr)	\$ 35,282.00	
Riverbend Engineering, Inc. (Chris Phillips, \$75/hr)	\$ 82,410.00	
Pathfinder Environmental, LLC (Devin Kennemore, \$75/hr)		\$ 6,000.00
Totals	\$ 156,017.00	\$ 104,200.00

References

ⁱ Upper Pecos Watershed Protection and Restoration Plan, Accessed at:
<https://www.env.nm.gov/swqb/wps/WBP/Accepted/Pecos/Upper>

ⁱⁱ USEPA Acceptance Letter, Accessed at:
<https://www.env.nm.gov/swqb/wps/WBP/Accepted/Pecos/Upper>

ⁱⁱⁱ 2016-2018 State of New Mexico US EPA-Approved CWA §303(d) / §305(b) Integrated List,
Accessed at: <https://www.env.nm.gov/swqb/303d-305b>

^{iv} 2005 Pecos Headwaters TMDL, Accessed at:
<https://www.env.nm.gov/swqb/Pecos/Upper/index.html>